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## ABSTRACT

A reading test and three cloze tests (English, health, and social studies passages with fifth/sixth grade readability levels) were administered to 410 ninth grade students to study the relationship between cloze errors and reading ability. Six types of incorrect responses were considered: synonymous, syntactically acceptable but semantically unacceptable, syntactically and semantically unacceptable, syntactically and semantically acceptable within the thought unit, nonstandard English or slang, and no response whatsoever. Significant differences were found in the mean number of correct responses by students with varying levels of reading ability (low, average, and high). When types of incorrect responses were examined, only the nonstandard English/slang errors were found to be not significant. All other types of incorrect responses produced significant differences across levels of reading ability. Synonym-type errors were associated with adequate reading ability, while most of the other types of errors were associated with low reading ability. The number of incorrect responses of each type (except for nonstandard English/slang) seemed to indicate a student's relative reading ability and the relative ease or difficulty of the material from which the cloze passage was taken. (RL)

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Incorrect Responses on Cloze Tests  
and  
Their Relationship to Reading Ability

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Incorrect Responses on Cloze Tests  
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9

Researchers have recognized the varied uses of the cloze but the analysis of cloze responses has not received equal attention. Coleman (1971) interpreted cloze responses as measures of passage complexity, and Rousch (1972) analyzed cloze responses in terms of the Good~~man~~ Taxonomy of Reading Miscues (1973). Their findings were too specific to warrant generalized statements regarding cloze responses.

The cloze procedure has shown itself to be a useful instrument for studying the relationship of language to reading comprehension (Ruddell, 1965). A linguistic analysis of the types of incorrect responses on a cloze test may provide greater insight into this relationship, and, perhaps, into the process of reading comprehension itself. An analysis of the incorrect responses made on a cloze test may result also in a deeper understanding of the process of completing a cloze procedure. A need appeared to exist to develop a system of classifying and analyzing incorrect responses.

A closely related but unexplored area of study is the relationship of the subject matter of the cloze passage to the cloze responses. An examination into the different areas of subject matter used in cloze passages may provide an additional dimension to the analysis of incorrect responses. Since the cloze has been shown to

be an efficient measuring device of reading ability (Hafner, 1964), it would be useful to discover how the cloze responses relate to the reading ability of the respondent. A need appeared to exist to investigate the types of incorrect responses on cloze tests as they relate to different areas of subject matter and to reading ability.

#### Purposes and exploratory questions

The major purposes of this study were:

1. To investigate whether there was a significant difference in the number of correct responses on cloze passages from 3 subject areas--English, health, and social studies--made by ninth-grade students of 3 levels of reading ability.

2. To investigate whether there was a significant difference in the types of incorrect responses on cloze passages from 3 subject areas--English, health, and social studies--made by ninth-grade students of 3 levels of reading ability.

3. To investigate the relationship of reading ability of ninth-grade students to their performance on cloze passages from 3 subject areas--English, health, and social studies.

4. To describe and analyze the types of incorrect responses on cloze passages from 3 subject areas--English, health, and social studies--made by ninth-grade students and their relationship to reading ability.

The following exploratory questions were posed:

1. What insights into the subjects' reading behavior can be gained from a system of classification

and analysis of their cloze responses?

2. How does a system of classification and analysis of cloze responses advance the potential of the cloze procedure?

3. What changes in the construction and scoring of the cloze procedure seem warranted?

4. How can the usefulness of the cloze procedure be applied where it is needed most--in the classroom?

### Significance

The study sheds new light on the relationship between reading ability as measured by a standardized test and as measured by performance on cloze tests. It points out areas of the secondary-school curriculum which may be a source of reading difficulty for students of different reading ability. It indicates how the data collected from a cloze test may provide teachers with up-to-date information about how each of their students in the class read the textbooks used in the classroom.

### Background

The cloze procedure as first conceived by Taylor (1953) is made by replacing every nth word in a passage with an underlined blank of a standard length. The subject responding to the cloze procedure is instructed to guess the words which were eliminated and to write them in the appropriate blank spaces.

The cloze procedure has been researched as a valid and reliable measure of reading comprehension (Taylor, 1956, 1957; Rankin, 1959a; Bormuth, 1963, 1968a),

as a measure of readability (Bormuth, 1966), as a tool for the diagnosis and remediation of reading difficulties (Rankin, 1959b), and as a teaching technique (Jongsma, 1971; Grant, 1979). It has been the subject of factor validity studies (Weaver and Kingston, 1977; Bormuth, 1969a; Horton, 1973).

#### History and development of the cloze procedure

Taylor (1953, 1956, 1957) proposed that every fifth word in a passage be deleted in a cloze procedure. Bormuth (1964a) found that cloze procedures of less than 50 items were unreliable. Hafner (1964) showed that the scores on the cloze procedure correlated with measures of intelligence, vocabulary, information, and grades. Cloze scores correlated highly with scores on multiple-choice comprehension questions on the same passages (Bormuth, 1967, 1968b; Rankin and Culhane, 1969), and with scores on standardized reading tests (Bormuth, 1968a). Studies (Taylor, 1953; Ruddell, 1964; Bormuth, 1965) indicated that scoring exact responses as correct is objective, efficient, and useful.

#### Cloze procedure as a measure of readability

Before the introduction of the cloze procedure as a method of measuring language variables, word frequency and word and sentence difficulty received the most attention (Gray and Leary, 1935; Lorge, 1939, 1944, 1948; Flesch, 1943, 1948; Dale and Chall, 1948). Early studies seemed to have suffered from poorly developed psychological and linguistic theories. Modern researchers have tried

to analyze the processes involved in the comprehension of reading passages and their relationship to language variables. The cloze procedure was introduced as a device to help accomplish this objective.

Cloze scores were found to be useful in measuring the complexity of a passage because they related to the total constraint in the passage and gave a measure of readability over the whole range of difficulty (Miller and Coleman, 1967). Bormuth (1964b) showed a correlation of .78 between the mean of word depths for each of 9 passages and cloze scores for the same passages. His conclusion was that the mean word depth measure was better able to predict differences in comprehension difficulty among passages that differed in their subject-matter content than were the factors in the Dale-Chall Readability Formula (1948). He hoped that schools would not persist in using readability formulas which included sentence length as an important criterion measure of the materials they purchased. This could only result in requiring authors to write short, choppy, and absurd sentences which would probably be no easier than many longer and esthetically better sentences.

In an attempt to develop an accurate formula for predicting and controlling the readability of language, Bormuth (1966) administered 20 cloze tests to 675 students in grades 4 through 8. He found that correlations between linguistic variables and difficulty did not change as a function of reading ability. In a later study (Bormuth, 1968c), when cloze tests were administered to 695 subjects

in grades 4 through 8, Bormuth stated that the relationship between comprehension difficulty and measures of grammatical complexity was as effective in ranking the readabilities of written materials for good readers as for poor readers.

Jefferson (1970) administered 6 of the 20 cloze passages used in Bormuth's 1966 study to the entire enrollment of students in grades 8 through 12 in a school district in Georgia. He found that his subjects ranked the passages differently than did Bormuth's fourth- through eighth-grade students. Future research should pay closer attention to age and the interaction among subject variables and linguistic variables was the recommendation of the investigator.

Bormuth (1969b) suggested that measures of passage complexity should take into account the possibility that comprehension involves the memory of structures which are not yet completed at a given point in the sentence as well as the anticipation of structures begun but not yet completed. Constructing readability formulas which exhibited face validity, good predictive validity, and economy for the user would be difficult. Researchers should be concerned not just with identifying variables which would permit educators to predict the difficulty of materials but also with determining if those variables could be manipulated, and, if so, if their manipulation produced effects upon the difficulty of materials.

In a further effort to develop standards of readability, Bormuth (1971) attempted to create and demonstrate a model for identifying criterion levels of

performance that could be rationally defended as being the best level of performance for a particular instructional task. Cloze tests were administered to all the students in grades 3 through 12 who were enrolled in the schools of a suburban community. The specific objective was to identify the score on a cloze test that represented the most desirable level of performance on instructional materials. Though the model itself might contain certain bias, Bormuth concluded that its major strength lay in the model and the data used to derive it.

#### Analysis of cloze responses

The cloze procedure offers an opportunity to study the interaction of the subject and the material through an examination of the responses to the deleted items. Using Fries' (1952) classification of words, and a scale of comprehensibility as measured by cloze scores, Coleman (1971) researched the stimulus dimensions that affected the learning of prose. A measure based upon 2,400 responses per passage (there were 36 passages) was obtained. When function words predominated over content words, the passage was easy to understand. Clause length seemed to be more directly related to comprehensibility than sentence length. The most easily counted dimension that promised high predictive power in readability was probably the percentage of 1-syllable words. The second most easily counted predictor was probably the number of sentences per hundred words.

Coleman and Blumenfeld (1963) found that cloze comprehension scores were significantly higher for mate-

rials containing the active-verb form than for materials containing nouns nominalized from verbs. There was a significantly greater number of content words than function words that were filled in correctly in the active-verb sentences. Heitzman and Bloomer (1967) stated that cloze deletions such as nouns apparently offered more information and were more like conventional reading material than modifier deletions. The deletion of modifiers appeared to distort the meaning of a passage to a sufficient degree as to make the quality of the reading skill of the subject irrelevant to the number of comprehension questions answered correctly.

Louthan (1965) prepared 24 passages in 7 cloze forms. Deletions were made according to specific grammatical class. In the passages where there were noun deletions, modifier deletions, or random deletions, there was an appreciable loss of comprehension.

Aquino, Mosberg, and Sharron (1969) investigated the relationship of general reading ability to the comprehension of material from different content areas as measured by cloze test performance. They concluded that Latin suffixes were a powerful predictor of cloze difficulty and covaried with word length and unfamiliarity of words as a measure of passage difficulty. Function words were easier than content words in the cloze test because they provided both syntactic and semantic redundancies. Reading ability did not appear to be differentially related to differences in cloze performance over content areas. Ohnmacht, Weaver, and Kohler (1970) suggested that there should be an exploration of a wider range of deletion

types which would be related to particular linguistic and psychological hypotheses. Ohnmacht and Fleming (1972) recommended that deletion strategies should focus on the variables of word order or sentence structure.

### Interpretation of cloze performance

Researchers have used the cloze procedure to examine how the subjects, through the task of completing cloze units, used their comprehension skills and language ability. The products of their searching give the investigator cues to their language processes (Weaver, 1977). Weaver and Kingston (1977) indicated that underlying the ability to supply words in a cloze test was the recognition of redundant characteristics of language. Ruddell (1965) concluded that reading comprehension was a function of the redundancy of the syntactical elements used in the written materials. Because of the redundancy of the language, information which an individual may miss within the boundaries of a particular sentence may be acquired within some other sentences (Fagan, 1971). The cloze test seemed to measure the ability to successfully respond to various word lengths (Rentel and Kennedy, 1970), to locate high-information images, recover potential responses, and decide about whether or not a response fits the constraints of the sentence (Tuinman, 1972).

Horizontal and vertical constraints were important in the comprehension of competent readers (Weaver, Kingston, and Dinnan, 1977). While the influence of context upon cloze performance decreased rapidly with the distance of the context, constraints could operate over distances of more than four or five words where they

had a generalized influence that did not decline with increasing length of context (MacGinitie, 1961).

Conceptual knowledge was of some advantage in inserting the exact replications of deleted cloze words (Rousch, 1972). Better students recognized syntactical clues more frequently than poorer students, though both groups appeared to focus attention on the meanings rather than on the language form conveying meaning in the cloze procedure (Jenkinson, 1957).

A review of the research literature tracing the history and development of the cloze procedure seems to support its use as a valid and reliable measure of reading comprehension, as a measure of linguistic variables in the study of readability, and as an effective tool for the examination of the reading process. Some weaknesses in reporting appeared to recur: Researchers often neglected to indicate the type of cloze procedure used and the deletion pattern. The material over which the cloze tests were made was not fully described or graded. Some researchers did not mention the criterion levels for the scoring system. A rather common omission was a description of the subjects in the studies, especially their reading levels.

Nevertheless, the survey of the research literature on the cloze procedure has suggested its utility to examine further the interaction of the reader with the written material in order to investigate what makes written language difficult to understand. An analysis of the incorrect responses on cloze passages written over different subject areas may facilitate this type of

study. It could provide more information about the reading process by pointing out which incorrect responses are the best predictors of reading ability.

### Design of the study

Hypotheses. The following hypotheses were tested:

1. There are no significant differences in the number of correct responses on a cloze passage constructed from material used in the English curriculum made by ninth-grade students of three levels of reading ability--low, average, and high--as measured by a standardized reading test.

2. There are no significant differences in the types of incorrect responses on a cloze passage constructed from material used in the English curriculum made by ninth-grade students of three levels of reading ability--low, average, and high--as measured by a standardized reading test.

3. There are no significant differences in the number of correct responses on a cloze passage constructed from material used in the health curriculum made by ninth-grade students of three levels of reading ability--low, average, and high--as measured by a standardized reading test.

4. There are no significant differences in the types of incorrect responses on a cloze passage constructed from material used in the health curriculum made by ninth-grade students of three levels of reading ability--low, average, and high--as measured by a standardized reading test.

5. There are no significant differences in the number of correct responses on a cloze passage constructed from material used in the social studies curriculum made by ninth-grade students of three levels of reading ability --low, average, and high--as measured by a standardized reading test.

6. There are no significant differences in the types of incorrect responses on a cloze passage constructed from material used in the social studies curriculum made by ninth-grade students of three levels of reading ability-- low, average, and high--as measured by a standardized reading test.

7. The number of correct responses on cloze passages constructed from material used in the English, health, and social studies curricula made by ninth-grade students will result in no significant increase in the amount of variance accounted for in reading ability as measured by a standardized reading test.

8. The types of incorrect responses on cloze passages constructed from material used in the English, health, and social studies curricula made by ninth-grade students will result in no significant increase in the amount of variance accounted for in reading ability as measured by a standardized reading test.

#### Definition of terms.

1. Cloze test procedure: A passage not previously read of about 280 words was selected. Except for the first and last, or part of the last sentence which remained intact, every fifth word was replaced with an underlined blank of a standard length for a

total of 50 words. Subjects were instructed to write in the words they thought were deleted. Exact-word replacements, with allowances for misspellings and poor penmanship, were counted as correct.

2. Readability formula: An instrument used to measure the readability of a passage based upon the factors of vocabulary and sentence length. In this study, the Dale-Chall Readability Formula (1948) was used to measure the readability of the three cloze passages.

3. Ability groups: The percentile score on the Gates-MacGinitie Reading Test (1964), Survey E, Form I, Part III (Comprehension) of each subject determined the placement in the ability group. The groups were: group 1 (low), twenty-fourth percentile and below; group 2 (average), twenty-seventh through seventy-third percentile; and group 3 (high), seventy-ninth percentile and above.

4. Thought unit: A group of words which expressed a different thought from the group of words which preceded it or followed it. This might be a sentence, a clause, or a phrase.

5. Type of incorrect cloze response: An analysis of the incorrect responses on a cloze passage. In this study, the sentences in the cloze passages were separated into thought units. Six types of incorrect responses were identified, either within the passage or within the thought unit.

6. Syntax: The arrangement of words in a language into grammatical sequence.

7. Semantics: The study of meaning in language.

Subjects. The subjects were 410 ninth-grade students of low, average, and high reading ability attending a high school in western [REDACTED]

[REDACTED] When the study was conducted, about 33 per cent of the 2,200 students in the school was black and Hispanic. The inhabitants of the community range from middle to low socio-economic status.

The results of this study can be generalized only to ninth-grade students in school districts with the same characteristics and to reading material of the same type as used in this study.

Instruments and procedures. The Gates-MacGinitie Reading Test (1964), Survey E, Form 1, Part 3 (Comprehension) was used to measure reading ability.

Three passages were selected, one each from material used in the ninth-grade English, health, and social studies curricula. Cloze tests were constructed over the passages by the investigator. Each passage had a readability score within the fifth-sixth-grade level. The reading test and the three cloze tests were administered to all 410 subjects.

Criteria levels for the number of correct responses produced on the cloze tests (Bormuth, 1968), comparable multiple-choice test scores (Rankin and Culhane, 1969), and corresponding levels of reading (Betts, 1946), were defined. (See Table 1.)

Classification system. The investigator developed a classification system to analyze and describe all incorrect cloze responses. <sup>16</sup> The system was devised

so that all incorrect responses would be included and classifiable. The sentences in the cloze passages were separated into thought units.

Flesch (1948, p. 229) recommended that readability measures "follow the units of thought rather than the punctuation." Coleman (1971) suggested that the basic units of understanding in a passage could be an effective measure of its complexity. Bormuth (1966) showed that language units such as phrases and clauses could be used as variables in readability measures. Goodman (1973) emphasized the superiority of syntactic acceptability over semantic acceptability of a word in a sentence. The investigator assumed that this statement could be applied also to a word in a thought unit.

Six types or categories of incorrect responses were developed. All incorrect responses were classified by types by the investigator according to the 6 categories of incorrect responses. Reliability of agreement by a qualified evaluator on the classification of the incorrect responses for the three cloze tests was 98.7 per cent.

The 6 types of incorrect responses were:

Type I incorrect response:

The response was syntactically acceptable and semantically acceptable within the passage and was a synonym found in a thesaurus (1977) or in an unabridged dictionary (1971).

Example:

Text: He's sure to make trouble.

Incorrect response: He's sure to cause trouble.

Type II incorrect response:

The response was syntactically acceptable but semantically unacceptable within the passage.

Example:

Text: I am a large, sturdy woman . . . .

Incorrect response: I am a large, sturdy  
house . . . .

Type III incorrect response:

The response was syntactically unacceptable and semantically unacceptable within the passage.

Example:

Text: . . . and he ran the streets and alleys . . . .

Incorrect response: . . . and lived ran the  
streets and alleys . . . .

Type IV incorrect response:

The response was syntactically acceptable and semantically acceptable within the thought unit.

Example:

Text: I had the weight on him, . . .

Incorrect response: I had the story on him, . . .

Type V incorrect response:

The response was nonstandard English or slang. It was incorrect in relation to the author's style but comprehensible within the thought unit.

Example:

Text: . . . if others are drinking, . . .

Incorrect response: . . . if others be drink-  
ing, . . .

Type VI incorrect response:

There was no response.

Treatment of the data. Means and standard deviations were computed for all variables by reading group--low, average, and high--as well as for the total group.

Percentile scores on the standardized reading test for each subject were converted to normal curve equivalent scores for use as interval data suitable to multiple stepwise regression analyses where reading ability by individual subject was a variable.

A Pearson Product-Moment Coefficient of Correlation matrix was calculated for all the variables included in the investigation.

Hypotheses 1-6 were tested through the use of a 1-way analysis of variance to determine whether the observed differences among the means were statistically significant.

The analysis of variance was followed by the Scheffé multiple comparisons test of the means to determine where significant differences among the means existed when a significant F was computed.

Hypotheses 7 and 8 were tested through the use of multiple stepwise regression analyses to determine the amount of variance accounted for in reading ability by the number of correct responses and types of incorrect responses on the cloze passages.

A posteriori factor analyses were computed. Varimax criteria and orthogonal rotations were used in computations for factor extractions. Factor loadings

of .25, or greater, were considered significant.

Analyses of covariance were computed to determine whether the lack of randomization in the administration of the three cloze tests resulted in a practice effect. No practice effects were found.

All measures were considered significant if they equaled or exceeded the .05 level.

### Findings

Significant differences were found in the mean number of correct responses on cloze passages constructed from material used in the English, health, and social studies curricula made by ninth-grade students of 3 levels of reading ability--low, average, and high--as measured by a standardized reading test. There were significant differences among all three means for the number of correct responses produced on all 3 cloze passages. (See Tables 2, 3, and 4.)

Significant differences were found in the mean number of Type I incorrect responses (syntactically and semantically acceptable within the passage and a synonym found in a thesaurus or in an unabridged dictionary) on cloze passages constructed from material used in the English, health, and social studies curricula made by ninth-grade students of 3 levels of reading ability--low, average, and high--as measured by a standardized reading test. There were significant differences among all three means for the number of Type I incorrect responses produced on the 3 cloze passages except between the average group and the high group on the English cloze

passage.

The production of Type I incorrect responses on a cloze passage appeared to be an indication of a) reading ability, b) the ability to produce a response on a cloze passage which was most similar to the correct one, c) the difficulty of the cloze passage for the subjects when the number of Type I incorrect responses was relatively high, and d) the ease of the cloze passage for the subjects when the number of Type I incorrect responses was relatively low. (See Tables 5, 6, and 7.)

Significant differences were found in the mean number of Type II incorrect responses (syntactically acceptable but semantically unacceptable within the passage) on cloze passages constructed from material used in the English, health, and social studies curricula made by ninth-grade students of 3 levels of reading ability--low, average, and high--as measured by a standardized reading test. There were significant differences among all 3 means for the number of Type II incorrect responses produced on all 3 cloze passages except between the average group and the high group on the social studies cloze passage.

The production of Type II incorrect responses on a cloze passage appeared to be an indication of a) relatively low reading ability, b) an understanding of syntactic, but not semantic, relationships, c) the difficulty of the cloze passage for the subjects when the number of Type II incorrect responses was relatively high, and d) the ease of the cloze passage for the subjects when the number of Type II incorrect responses was relatively low. (See Tables 8, 9, and 10.)

Significant differences were found in the mean number of Type III incorrect responses (syntactically and semantically unacceptable within the passage) on cloze passages constructed from material used in the English, health, and social studies curricula made by ninth-grade students of 3 levels of reading ability--low, average, and high, as measured by a standardized reading test. There were significant differences among all 3 means for the number of Type III incorrect responses produced on all 3 cloze passages except between the average group and the high group on the social studies cloze passage.

The production of Type III incorrect responses on a cloze passage appeared to be an indication of a) relatively low reading ability, b) the inability of the subjects to complete a cloze passage successfully, and c) the ease of the cloze passage for the subjects when the number of Type III incorrect responses was relatively low. (See Tables 11, 12, and 13.)

Significant differences were found in the mean number of Type IV incorrect responses (syntactically and semantically acceptable within the thought unit) on cloze passages constructed from material used in the English, health, and social studies curricula made by ninth-grade students of 3 levels of reading ability--low, average, and high--as measured by a standardized reading test. There were significant differences among all 3 means for the number of Type IV incorrect responses produced on all 3 cloze passages except between the low group and the average group on the English and the health

cloze passage.

The production of Type IV incorrect responses on a cloze passage appeared to be an indication of a) relatively low reading ability, and b) the inability of the subjects to look beyond the thought unit for clues to produce a correct cloze response. (See Tables 14, 15, and 16.)

No significant differences were found in the mean number of Type V incorrect responses (nonstandard or slang but comprehensible within the thought unit) on cloze passages constructed from material used in the English, health, and social studies curricula made by ninth-grade students of 3 levels of reading ability--low, average, and high--as measured by a standardized reading test.

In developing this category of incorrect response, the investigator assumed that the subjects would produce a greater number of Type V incorrect responses than they did. The relatively low mean number of Type V incorrect responses on all 3 cloze passages, and the lack of significance among the 3 means on all 3 cloze passages, suggested that, for the purposes of this investigation, the Type V category of incorrect response was not appropriate. An examination of these incorrect responses may provide some data for a future study of nonstandard or slang language as it was produced on the 3 cloze passages. (See Tables 17, 18, and 19.)

Significant differences were found in the mean number of Type VI incorrect responses (no response) on cloze passages constructed from material used in the

English, health, and social studies curricula made by ninth-grade students of 3 levels of reading ability--low, average, and high--as measured by a standardized reading test. There were significant differences among the 3 means for the number of Type VI incorrect responses produced on all 3 cloze passages except between the average group and the high group on all 3 cloze passages.

The production of Type VI incorrect responses on a cloze passage appeared to be an indication of a) relatively low reading ability, and b) the inability or, perhaps unwillingness, of subjects to supply the right response on a cloze deletion. (See Tables 20, 21, and 22.)

The rank order of the three means in all the analyses of the means for the number of correct and 5 types of incorrect responses (Types I, II, III, IV, and VI) produced on the 3 cloze passages was in the order of reading ability except for the means for the number of Type IV incorrect responses produced on the English cloze passage.

Multiple stepwise regression analysis revealed that the number of correct responses produced on cloze passages constructed from material used in the English, health, and social studies curricula by ninth-grade students resulted in a significant increase in the amount of variance accounted for in reading ability as measured by a standardized reading test.

When the number of correct responses produced on each cloze test was entered into the multiple stepwise regression equation, each significantly accounted

for more than half the variance in reading ability as measured by a standardized reading test. The total variance accounted for in reading ability was nearly 66 per cent. (See Table 23.)

Multiple stepwise regression analyses revealed that each of the 6 types of incorrect responses produced on cloze passages constructed from material used in the English, health, and social studies curricula by ninth-grade students resulted in a significant increase in the amount of variance accounted for in reading ability as measured by a standardized reading test. (See Tables 24, 25, and 26.)

Six factors were extracted in the English cloze factor analysis and 5 factors were extracted in the health cloze factor analysis. Factoring could not be done for the social studies correlation matrix. A high degree of factorial invariance seemed to exist between the English cloze and health cloze factor analysis. (See Tables 27 and 28.)

A cloze-reading-ability factor appeared to be the ability to supply correct responses on a cloze passage and reading ability as measured by a standardized reading test.

A limited-view factor appeared to be the ability to supply a response on a cloze passage which was syntactically and semantically acceptable within the thought unit.

A separate factor appeared to be the ability to supply acceptable synonyms on a cloze passage.

An omission factor appeared to be the inability or, perhaps unwillingness, to supply any response on a cloze passage.

A syntactic-but-not-semantic factor appeared to be the ability to supply a response on a cloze passage which was syntactically acceptable but semantically unacceptable within the passage.

A nonstandard or slang factor was extracted from the English cloze matrix.

### Conclusions

Conclusions were based upon the collected data and supported by the findings. They should be understood in relation to the limitations of the study.

The classification and analysis system was a system through which the different facets of the incorrect responses were refracted. Through the use of this system, a more varied representation of the subjects' efforts to complete the cloze procedure was revealed. The type of incorrect response produced on a cloze procedure appeared to be an indication of the factors or skills which the subjects possessed or lacked in order to provide the correct response.

As a means of examining the types of incorrect responses through the classification and analysis system, the cloze procedure may become a refined diagnostic instrument. The data from this system may be used to diagnose and improve cloze scores which may affect reading comprehension ability.

The number of each type of incorrect response (except Type V) produced by the subjects seemed to indicate their relative reading ability and the relative

ease or difficulty for them of the material from which the cloze passage was taken. Strategies to apply the information obtained instructionally may also be derived.

The classification and analysis system of cloze responses may be used in the classroom to rank students according to their ability to comprehend the material in their current textbooks.

### Implications

For the theory of reading. The classification and analysis system makes it possible to examine how well the subjects utilize characteristics of language in a cloze passage. The system enables the investigator to get a "close-up view of what is occurring at particular points in a language passage" (Weaver, 1977, p. 31). In addition, those elements identified as components of successful performance on a cloze procedure and a standardized reading test are some of those which the reader must actively employ to acquire information during the reading process.

For the measurement of reading ability in the secondary school. Instead of the language and subject matter of standardized tests, which is often not relevant to students, this study has introduced a system employing students' present instructional materials which may be used to yield immediate and specific information regarding the ability of the students to read these materials. Data collected from this system provide details about each student's relative reading ability in the group, and the group's average reading ability. 27

The results of a classification and analysis

system of construction and scoring cloze procedures drawn from current materials in the secondary-school curriculum may be utilized to place students in appropriate instructional groups. Cloze activities can be learning activities, and thus educational time is not forfeited while additional cloze procedures are scheduled to ensure that the students' placement in each subject-area classroom is evaluated. The system is quick and economical--no special paper, pencils, or machinery are required for construction and scoring. Finally, the classification and analysis system provides an insight into and a quantifiable measure of the strategies used by the student to complete a cloze procedure which are similar to those employed in the reading process.

For a program of reading instruction in the secondary school. The classification and analysis system developed in this investigation extends and refines the uses of the cloze procedure as an effective device in a program of reading instruction in the secondary school.

Educators need to know whether the materials currently in use in their schools are suitable to the students' reading ability. Publishers do supply readability levels for some of their materials but this information may be insufficient for choosing appropriate texts in a particular school.

This investigation has shown how the 3 cloze procedures and the 6 types of incorrect responses were predictors of reading ability. The scores produced on the cloze procedures ranked the subjects according to their reading ability. The incorrect responses provided

new measures of the subjects' reading difficulties. The thought unit, smaller than the sentence which is traditionally used as a readability measure, was instrumental in examining reading performance. Application of the classification and analysis system to cloze passages drawn from textbooks and other materials in the curriculum to determine the readability of these textbooks and materials for the students who will read them, may make it possible for teachers and administrators to select books and other reading matter which meet the varied and diverse needs of their students with greater confidence and accuracy.

The classification and analysis system may be used to affect other aspects of the school program. The data collected from the use of the system provide a diagnostic framework for the improvement of reading. A diagnostic application of the classification and analysis system to a program of reading instruction would, for example, emphasize the teaching of synonyms. The investigator found that the ability to supply acceptable synonyms on a cloze passage was a factor positively correlated with reading ability. The data collected from the use of the system also supply information to help group or track students according to their ability to comprehend the cloze passages written over materials from the different content areas.

For writing and publishing for the secondary school. The results of this investigation revealed differences in comprehension ability as measured by responses

on cloze passages from materials used in the ninth-grade curriculum. Writers and publishers need to be aware of these differences and of the variables which create difficulty for students of different levels of reading ability. They should be aware of the potential usefulness of the classification and analysis system as a measure of the comprehensibility of materials and of these variables. Publishers should field test their materials with prospective students utilizing cloze procedures written over selected passages. Incorrect responses should be classified and analyzed and more readable revisions created by eliminating sources of difficulty which fostered the incorrect responses.

Writers and publishers should develop cloze materials in the content areas for secondary-school students who need to improve their reading skills. The cloze procedures should be structured to enable the student and the teacher to identify easily the type of incorrect response and remediate it.

#### Suggestions for further research

1. A replicated study with a population from a different socio-economic and grade level, and materials from different subject areas.
2. A comparison of the language of the incorrect responses to selected deletions by subjects of

varying levels of reading ability.

3. A study to determine how a program of instruction to remediate types of incorrect responses on cloze procedures affects reading ability.

4. A study to determine whether materials revised as a result of the classification and analysis system of incorrect responses on cloze procedures affect comprehensibility.

5. A study to determine whether students' analyses of their own incorrect responses on cloze procedures affect cloze scores and reading ability.

6. A study to develop additional classification and analysis systems of incorrect cloze responses.

7. The reliability of the types of incorrect responses should be established in a statistical study.

## References

- Aquino, M.; Mosbert, L.; & Sharron, M. Reading comprehension difficulty as a function of content area and linguistic complexity. Journal of Experimental Education, Summer 1969, 37 (4), 1-4.
- Bormuth, J. R. Cloze as a measure of readability. In J. A. Figurel (Ed.) Reading as an intellectual activity (Proceedings of the International Reading Association). New York: International Reading Association, 1963.
- Bormuth, J. R. The cloze readability procedure. In J. R. Bormuth (Ed.) Readability in 1968. Chicago: National Council of Teachers of English, 1968a.
- Bormuth, J. R. Cloze test readability: criterion reference scores. Journal of Educational Measurement, Fall 1968b, 5 (3), 189-196.
- Bormuth, J. R. Comparable cloze and multiple-choice comprehension test scores. Journal of Reading, February 1967, 10 (5), 291-299.
- Bormuth, J. R. Development of readability analysis (ERIC Document 029166). Washington, D. C.: U. S. Educational Resources Information Center, 1969b.
- Bormuth J. R. Development of standards of readability (ERIC Document 054233). Washington, D. C.: U. S. Educational Resources Information Center, 1971.

Bormuth, J. R. Experimental applications of cloze tests.

In J. A. Figurel (Ed.) Improvement of reading through classroom practice (Proceedings of the International Reading Association). Newark, Del.: International Reading Association, 1964a.

Bormuth, J. R. Factor validity of cloze tests as measures of reading comprehension ability. Reading Research Quarterly, Spring 1969a, 4 (3), 358-365.

Bormuth, J. R. Mean word depth as a predictor of comprehension difficulty. California Journal of Educational Research, November 1964b, 15 (5), 226-231.

Bormuth, J. R. New measures of grammatical complexity. In K. S. Goodman (Ed.) The psycholinguistic nature of the reading process. Detroit: Wayne State University Press, 1968c.

Bormuth, J. R. Readability: a new approach. Reading Research Quarterly, Spring 1966, 1 (3), 79-132.

Bormuth, J. R. Validities of grammatical and semantical classifications of cloze test scores. In J. A. Figurel (Ed.) Reading and Inquiry (Proceedings of the International Reading Association). Newark, Del.: International Reading Association, 1965.

Chapman, R. L. (Ed.) Roget's international thesaurus. (4th ed.). New York: Thomas Y. Crowell, 1977.

Coleman, E. B. Developing a technology of written instruction: some determiners of complexity in prose. In

E. Z. Rothkopf & P. E. Johnson (Eds.) Verbal learning research and the technology of written instruction.

New York: Teachers College Press, Columbia University, 1971.

Coleman, E. B., & Blumenfeld, J. P. Cloze scores of nominalizations and their grammatical transformations using active verbs. Psychological Reports, December 1963, 13 (3), 651-654.

Dale, E., & Chall, J. S. A formula for predicting readability. Educational Research Bulletin, January 21, 1948, 27, 11-20 & February 17, 1948, 27, 38-54.

Fagan, W. T. Transformation and comprehension. The Reading Teacher, November 1971, 25 (2), 169-172.

Flesch, R. Marks of readable style; a study in adult education. New York: Teachers College, Columbia University, 1943.

Flesch, R. A new readability yardstick. Journal of Applied Psychology, June 1948, 32 (3), 221-233.

Fries, C. C. The structure of English. New York: Harcourt, Brace and World, 1952.

Goodman, K. S., & Burke, C. Appendix for theoretically based studies of patterns of miscues in oral reading performance (Final report, Project No. 9-0375, Grant No. OEG-0-9-320375-4269). Washington, D. C.: U. S. Dept. of Health, Education, and Welfare, 1973.

Gove, P. B. (Ed.) Webster's third new international

dictionary of the English language, unabridged.

Springfield, Mass.: G. & C. Merriam, 1971.

Grant, P. The cloze procedure as an instructional device.

Journal of Reading, May 1979, 22 (8), 699-705.

Gray, W. S., & Leary, B. E. What makes a book readable.

Chicago: University of Chicago Press, 1935.

Hafner, L. E. Relationships of various measures to the cloze. In E. L. Thurston & L. E. Hafner (Eds.)

New concepts in college-adult reading (Thirteenth Yearbook of the National Reading Conference). Milwaukee, Wis.: The National Reading Conference, 1964.

Heitzman, A. J., & Bloomer, R. H. The effect of non-overt reinforced cloze procedure upon reading comprehension. Journal of Reading, December 1967, 11 (3), 213-223.

Horton, R. J. The construct validity of cloze procedure: an exploratory factor analysis of cloze, paragraph reading, and structure-of-intellect tests. Unpublished doctoral dissertation, Hofstra University, 1973.

Jefferson, G. L. Lexical and structural items as predictors of readability for high and low ability readers. In G. B. Schick & M. M. May (Eds.) Reading: progress and pedagogy (Nineteenth Yearbook of the National Reading Conference, Vol. 1). Milwaukee, Wis.: The National Reading Conference, 1970.

- Jenkinson, M. D. Selected processes and difficulties of reading comprehension. Unpublished doctoral dissertation, University of Chicago, 1957.
- Jongsma, E. The cloze procedure as a teaching technique. Newark, Del.: International Reading Association, 1971.
- Lorge, I. The Lorge and Flesch readability formulae: a correction. School and Society, February 1948, 67 (1730), 141-142.
- Lorge, I. Predicting readability. Teachers College Record, March 1944, 45 (6), 404-419.
- Lorge, I. Predicting reading difficulty of selections for children. Elementary English Review, October 1939, 16, 229-233.
- Louthan, V. Some systematic grammatical deletions and their effect on reading comprehension. English Journal, April 1965, 54 (4), 295-299.
- MacGinitie, W. H. Contextual constraint in English prose paragraphs. Journal of Psychology, January 1961, 51, 121-130.
- Miller, G. R., & Coleman, E. B. A set of thirty-six prose passages calibrated for complexity. Journal of Verbal Learning and Verbal Behavior, December 1967, 6 (6), 851-854.
- Ohnmacht, F. W., & Fleming, J. T. Cloze and closure: a second analysis. In F. P. Greene (Ed.) Investigations relating to mature reading (Twenty-first

Yearbook of the National Reading Conference).

Milwaukee, Wis.: The National Reading Conference, 1972.

Ohnmacht, F. W.; Weaver, W. W.; & Kohler, T. Cloze and closure: a factorial study. Journal of Psychology, March 1970, 74 (2), 205-217.

Rankin, E. F. The cloze procedure--its validity and utility. In O. S. Causey & W. Eller (Eds.) Starting and improving college reading programs (Eighth Yearbook of the National Reading Conference). Milwaukee, Wis.: The National Reading Conference, 1959a.

Rankin, E. F. Uses of the cloze procedure in the reading clinic. In J. A. Figurel (Ed.) Reading in a changing society (Proceedings of the International Reading Association). New York: International Reading Association, 1959b.

Rankin, E. F., & Culhane, J. W. Comparable cloze and multiple-choice comprehension test scores. Journal of Reading, December 1969, 13 (3), 193-198.

Rentel, V. M., & Kennedy, J. J. Word length and form class factors in a sample of continuous prose. In G. B. Schick & M. M. May (Eds.) Reading: process and pedagogy (Nineteenth Yearbook of the National Reading Conference, Vol. 1). Milwaukee, Wis.: The National Reading Conference, 1970.

Rousch, P. D. A psycholinguistic investigation into the

relationship between prior conceptual knowledge, oral reading miscues, silent reading, and post-reading performance. Unpublished doctoral dissertation, Wayne State University, 1972.

Ruddell, R. B. Reading comprehension and structural redundancy in written material. In J. A. Figurel (Ed.) Reading and inquiry (Proceedings of the International Reading Association). Newark, Del.: International Reading Association, 1965.

Ruddell, R. B. A study of the cloze comprehension technique in relation to structurally controlled reading material. In J. A. Figurel (Ed.) Improvement of reading through classroom practice (Proceedings of the International Reading Association). Newark, Del.: International Reading Association, 1964.

Taylor, W. L. Cloze procedure: a new tool for measuring readability. Journalism Quarterly, Fall 1953, 30 (4), 415-433.

Taylor, W. L. Cloze readability scores as indices of individual differences in comprehension and attitude. Journal of Applied Psychology, February 1957, 41 (1), 19-26.

Taylor, W. L. Recent developments in the use of the cloze procedure. Journalism Quarterly, Winter 1956, 33 (1), 42-48, 99.

Tuinman, J. J. Speculations on cloze as a search procedure.

In F. P. Greene (Ed.) Investigations relating to mature reading (Twenty-first Yearbook of the National Reading Conference). Milwaukee, Wis.: The National Reading Conference, 1972.

Weaver, W. W. Theoretical aspects of the cloze procedure.

In A. J. Kingston (Ed.) Toward a psychology of reading, selected writings of Wendell W. Weaver. Athens: University of Ga. Press, 1977.

Weaver, W. W., & Kingston, A. J. A factor analysis of the cloze procedure and other measures of reading and language ability. In A. J. Kingston (Ed.) Toward a psychology of reading and language, selected writings of Wendell W. Weaver. Athens: University of Ga. Press, 1977.

Weaver, W. W.; Kingston, A. J.; & Dinnan, A. J. Vertical and horizontal constraints in the context reading of sentences. In A. J. Kingston (Ed.) Toward a psychology of reading, selected writings of Wendell W. Weaver. Athens: University of Ga. Press, 1977.

#### Test Reference

Gates-MacGinitie Reading Test - Survey E, Form 1. New York: Teachers College Press, Columbia University, 1964.

Table 1

Comparable Criteria Scores for Cloze Test Scores  
and Corresponding Levels of Reading

| Number of Correct<br>Responses on Cloze<br>Test | Comparable Criteria<br>Levels on Multiple-<br>choice Tests | Corresponding<br>Levels of<br>Reading |
|-------------------------------------------------|------------------------------------------------------------|---------------------------------------|
| 0-21                                            | less than 75%                                              | Frustration                           |
| 22-28                                           | 75% and above                                              | Instructional                         |
| 29-50                                           | 90% and above                                              | Independent                           |

Table 2

Analysis of Variance, Three Groups, Number of Correct Responses  
on English Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 8765.0508      | 4383.0254    | 166.530 | .001        |
| Within  | 407  | 10712.1484     | 26.3198      |         |             |
| Total   | 409  | 19478.1992     |              |         |             |

| Group   | N   | Mean    | Standard Deviation |
|---------|-----|---------|--------------------|
| Low     | 175 | 17.7429 | 5.3710             |
| Average | 179 | 24.7821 | 5.1541             |
| High    | 56  | 30.8214 | 4.1870             |
| Total   | 410 | 22.6024 | 6.9010             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 \neq \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 \neq \bar{X}_3$$

Table 3

Analysis of Variance, Three Groups, Number of Correct Responses on Health Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 5641.1191      | 2820.5596    | 178.894 | .001        |
| Within  | 407  | 6417.0391      | 15.7667      |         |             |
| Total   | 409  | 12058.1582     |              |         |             |

| Group   | N   | Mean    | Standard Deviation |
|---------|-----|---------|--------------------|
| Low     | 175 | 14.5771 | 4.0519             |
| Average | 179 | 20.5475 | 3.6569             |
| High    | 56  | 24.7679 | 4.6319             |
| Total   | 410 | 18.5756 | 5.4297             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 \neq \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 \neq \bar{X}_3$$

Table 4

Analysis of Variance, Three Groups, Number of Correct Responses on Social Studies Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 11833.6055     | 5916.8027    | 192.659 | .001        |
| Within  | 407  | 12499.4727     | 30.7112      |         |             |
| Total   | 409  | 24333.0781     |              |         |             |

| Group   | N   | Mean    | Standard Deviation |
|---------|-----|---------|--------------------|
| Low     | 175 | 19.9657 | 6.3797             |
| Average | 179 | 28.5531 | 5.2447             |
| High    | 56  | 34.7857 | 3.0790             |
| Total   | 410 | 25.7390 | 7.7132             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 \neq \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 \neq \bar{X}_3$$

Table 5

Analysis of Variance, Three Groups, Number of Type I Incorrect Responses on English Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 73.0742        | 36.5371      | 23.344  | .001        |
| Within  | 407  | 637.0136       | 1.5651       |         |             |
| Total   | 409  | 710.0878       |              |         |             |

| Group   | N   | Mean   | Standard Deviation |
|---------|-----|--------|--------------------|
| Low     | 175 | 1.5829 | 1.2698             |
| Average | 179 | 2.3911 | 1.2376             |
| High    | 56  | 2.5536 | 1.2346             |
| Total   | 410 | 2.0683 | 1.3176             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 \neq \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 = \bar{X}_3$$

Table 6.

Analysis of Variance, Three Groups, Number of Type I Incorrect Responses on Health Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 226.9095       | 113.4547     | 45.758  | .001        |
| Within  | 407  | 1009.1296      | 2.4794       |         |             |
| Total   | 409  | 1236.0392      |              |         |             |

| Group   | N   | Mean   | Standard Deviation |
|---------|-----|--------|--------------------|
| Low     | 175 | 3.4914 | 1.6535             |
| Average | 179 | 4.6704 | 1.4252             |
| High    | 56  | 5.5536 | 1.7676             |
| Total   | 410 | 4.2878 | 1.7334             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 \neq \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 \neq \bar{X}_3$$

Table 7

Analysis of Variance, Three Groups, Number of Type I Incorrect Responses on  
Social Studies Cloze, Means, Standard Deviations, Scheffe Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 104.0732       | 52.0366      | 33.910  | .001        |
| Within  | 407  | 624.5708       | 1.5346       |         |             |
| Total   | 409  | 728.6439       |              |         |             |

| Group   | N   | Mean   | Standard Deviation |
|---------|-----|--------|--------------------|
| Low     | 175 | 1.0629 | 1.1150             |
| Average | 179 | 1.9218 | 1.3301             |
| High    | 56  | 2.3929 | 1.3028             |
| Total   | 410 | 1.6195 | 1.3347             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 \neq \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 \neq \bar{X}_3$$

Table 8

Analysis of Variance, Three Groups, Number of Type II Incorrect Responses on English Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 192.6857       | 96.3428      | 44.149  | .001        |
| Within  | 407  | 888.1656       | 2.1822       |         |             |
| Total   | 409  | 1080.8513      |              |         |             |

| Group   | N   | Mean   | Standard Deviation |
|---------|-----|--------|--------------------|
| Low     | 175 | 3.0971 | 1.7704             |
| Average | 179 | 2.0112 | 1.3025             |
| High    | 56  | 1.1964 | .8617              |
| Total   | 410 | 2.3634 | 1.6256             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 \neq \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 \neq \bar{X}_3$$

Table 9

Analysis of Variance, Three Groups, Number of Type II Incorrect Responses on Health Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 398.3323       | 199.1661     | 56.980  | .001        |
| Within  | 407  | 1422.6166      | 3.4954       |         |             |
| Total   | 409  | 1820.9489      |              |         |             |

| Group   | N   | Mean   | Standard Deviation |
|---------|-----|--------|--------------------|
| Low     | 175 | 4.000  | 2.3193             |
| Average | 179 | 2.3855 | 1.5368             |
| High    | 56  | 1.3214 | 1.0972             |
| Total   | 410 | 2.9293 | 2.1100             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 \neq \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 \neq \bar{X}_3$$

Table 10

Analysis of Variance, Three Groups, Number of Type II Incorrect Responses on  
Social Studies Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 440.9937       | 220.4968     | 62.642  | .001        |
| Within  | 407  | 1432.6161      | 3.5199       |         |             |
| Total   | 409  | 1873.6098      |              |         |             |

| Group   | N   | Mean   | Standard Deviation |
|---------|-----|--------|--------------------|
| Low     | 175 | 3.4171 | 2.4407             |
| Average | 179 | 1.5363 | 1.4113             |
| High    | 56  | .8393  | .8692              |
| Total   | 410 | 2.2439 | 2.1403             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 \neq \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 = \bar{X}_3$$

Table 11

Analysis of Variance, Three Groups, Number of Type III Incorrect Responses on English Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 2351.5054      | 1175.7527    | 84.465  | .001        |
| Within  | 407  | 5665.4436      | 13.9200      |         |             |
| Total   | 409  | 8016.9490      |              |         |             |

| Group   | N   | Mean   | Standard Deviation |
|---------|-----|--------|--------------------|
| Low     | 175 | 7.3657 | 4.7974             |
| Average | 179 | 3.3184 | 2.9555             |
| High    | 56  | 1.0000 | 1.3883             |
| Total   | 410 | 4.7293 | 4.4273             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 \neq \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 \neq \bar{X}_3$$

Table 12

Analysis of Variance, Three Groups, Number of Type III Incorrect Responses on Health Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 1799.6112      | 899.8056     | 106.960 | .001        |
| Within  | 407  | 3423.9113      | 8.4126       |         |             |
| Total   | 409  | 5223.5245      |              |         |             |

| Group   | N   | Mean   | Standard Deviation |
|---------|-----|--------|--------------------|
| Low     | 175 | 6.7943 | 3.7559             |
| Average | 179 | 3.1117 | 2.2232             |
| High    | 56  | 1.4107 | 1.2760             |
| Total   | 410 | 4.4512 | 3.5737             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 \neq \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 \neq \bar{X}_3$$

Table 13

Analysis of Variance, Three Groups, Number of Type III Incorrect Responses on Social Studies Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 1449.6513      | 724.8257     | 91.456  | .001        |
| Within  | 407  | 3225.6268      | 7.9254       |         |             |
| Total   | 409  | 4675.2781      |              |         |             |

| Group   | N   | Mean   | Standard Deviation |
|---------|-----|--------|--------------------|
| Low     | 175 | 4.8400 | 3.9315             |
| Average | 179 | 1.3296 | 1.7085             |
| High    | 56  | .3393  | .5486              |
| Total   | 410 | 2.6927 | 3.3810             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 \neq \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 = \bar{X}_3$$

Table 14

Analysis of Variance, Three Groups, Number of Type IV Incorrect Responses on English Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 216.9277       | 108.4639     | 8.298   | .001        |
| Within  | 407  | 5319.8633      | 13.0709      |         |             |
| Total   | 409  | 5536.7910      |              |         |             |

  

| Group   | N   | Mean    | Standard Deviation |
|---------|-----|---------|--------------------|
| Low     | 175 | 14.8514 | 4.0614             |
| Average | 179 | 14.9162 | 3.3181             |
| High    | 56  | 12.7679 | 2.9848             |
| Total   | 410 | 14.5951 | 3.6793             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 = \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 \neq \bar{X}_3$$

Table 15

Analysis of Variance, Three Groups, Number of Type IV Incorrect Responses on Health Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 174.0674       | 87.0337      | 6.592   | .002        |
| Within  | 407  | 5373.7773      | 13.2034      |         |             |
| Total   | 409  | 5547.8457      |              |         |             |

| Group   | N   | Mean    | Standard Deviation |
|---------|-----|---------|--------------------|
| Low     | 175 | 18.0171 | 4.0364             |
| Average | 179 | 17.6480 | 3.2420             |
| High    | 56  | 16.0000 | 3.4850             |
| Total   | 410 | 17.5805 | 3.6830             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 = \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 \neq \bar{X}_3$$

Table 16

Analysis of Variance, Three Groups, Number of Type IV Incorrect Responses on Social Studies Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 1800.8838      | 900.4419     | 53.009  | .001        |
| Within  | 407  | 6913.5068      | 16.9865      |         |             |
| Total   | 409  | 8714.3906      |              |         |             |

| Group   | N   | Mean    | Standard Deviation |
|---------|-----|---------|--------------------|
| Low     | 175 | 17.7029 | 4.3711             |
| Average | 179 | 15.3575 | 4.2115             |
| High    | 56  | 11.3036 | 2.8021             |
| Total   | 410 | 15.8049 | 4.6159             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 \neq \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 \neq \bar{X}_3$$

Table 17

Analysis of Variance, Three Groups, Number of Type V Incorrect Responses on English Cloze, Means, Standard Deviations

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | .2926          | .1463        | .233    | .794NS*     |
| Within  | 407  | 255.7562       | .6284        |         |             |
| Total   | 409  | 256.0488       |              |         |             |

  

| Group   | N   | Mean  | Standard Deviation |
|---------|-----|-------|--------------------|
| Low     | 175 | .8286 | .7538              |
| Average | 179 | .8101 | .8398              |
| High    | 56  | .8929 | .7551              |
| Total   | 410 | .8293 | .7912              |

\*Tested for significance at the .05 level.

Table 18

Analysis of Variance, Three Groups, Number of Type V Incorrect Responses on Health Cloze, Means, Standard Deviations

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | .1518          | .0759        | 2.289   | .100NS*     |
| Within  | 407  | 13.4969        | .0332        |         |             |
| Total   | 409  | 13.6488        |              |         |             |

  

| Group   | N   | Mean  | Standard Deviation |
|---------|-----|-------|--------------------|
| Low     | 175 | .0514 | .2461              |
| Average | 179 | .0112 | .1054              |
| High    | 56  | .0179 | .1336              |
| Total   | 410 | .0293 | .1827              |

\*Tested for significance at the .05 level.

Table 19

Analysis of Variance, Three Groups, Number of Type V Incorrect Responses on  
Social Studies Cloze, Means, Standard Deviations

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | .0180          | .0090        | .929    | .398NS*     |
| Within  | 407  | 3.9430         | .0097        |         |             |
| Total   | 409  | 3.9610         |              |         |             |

  

| Group   | N   | Mean  | Standard Deviation |
|---------|-----|-------|--------------------|
| Low     | 175 | .0171 | .1302              |
| Average | 179 | .0056 | .0747              |
| High    | 56  | .0000 | .0000              |
| Total   | 410 | .0098 | .0984              |

\*Tested for significance at the .05 level.

Table 20

Analysis of Variance, Three Groups, Number of Type VI Incorrect Responses on English Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 943.4066       | 471.7033     | 18.790  | .001        |
| Within  | 407  | 10217.3837     | 25.1041      |         |             |
| Total   | 409  | 11160.7903     |              |         |             |

| Group   | N   | Mean   | Standard Deviation |
|---------|-----|--------|--------------------|
| Low     | 175 | 4.5143 | 6.9140             |
| Average | 179 | 1.7486 | 3.1460             |
| High    | 56  | .7679  | 1.5839             |
| Total   | 410 | 2.7951 | 5.2238             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 \neq \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 = \bar{X}_3$$

Table 21

Analysis of Variance, Three Groups, Number of Type VI Incorrect Responses on Health Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 203.2587       | 101.6293     | 5.427   | .005        |
| Within  | 407  | 7622.0975      | 18.7275      |         |             |
| Total   | 409  | 7825.3562      |              |         |             |

| Group   | N   | Mean   | Standard Deviation |
|---------|-----|--------|--------------------|
| Low     | 175 | 2.9771 | 5.5429             |
| Average | 179 | 1.6760 | 2.9805             |
| High    | 56  | 1.2679 | 3.5547             |
| Total   | 410 | 2.1756 | 4.3741             |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 \neq \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 = \bar{X}_3$$

Table 22

Analysis of Variance, Three Groups, Number of Type VI Incorrect Responses on Social Studies Cloze, Means, Standard Deviations, Scheffé Test

| Source  | D.F. | Sum of Squares | Mean Squares | F Ratio | Probability |
|---------|------|----------------|--------------|---------|-------------|
| Between | 2    | 441.2268       | 220.6134     | 16.857  | .001        |
| Within  | 407  | 5326.3951      | 13.0870      |         |             |
| Total   | 409  | 5767.6220      |              |         |             |

| Group   | N   | Mean   | Standard Deviation |
|---------|-----|--------|--------------------|
| Low     | 175 | 3.0229 | 4.9095             |
| Average | 179 | 1.2123 | 2.4700             |
| High    | 56  | .3393  | .9200              |
| Total   | 410 | 1.8659 |                    |

Scheffé Multiple Comparisons Test

$$\bar{X}_1 \neq \bar{X}_2, \bar{X}_1 \neq \bar{X}_3, \bar{X}_2 = \bar{X}_3$$

Table 23

Summary Table of Multiple Stepwise Regression  
Criterion Variable--Reading Ability  
Predictor Variables--Number of Correct  
Responses on Three Cloze Tests

| Step<br>Number | Variable                                                       | Multiple R | R Square | RSQ Change |
|----------------|----------------------------------------------------------------|------------|----------|------------|
| 1              | Number of correct<br>responses on social<br>studies cloze test | .75811     | .57474   | .57474     |
| 2              | Number of correct<br>responses on health<br>cloze test         | .79590     | .63346   | .05872     |
| 3              | Number of correct<br>responses on English<br>cloze test        | .80977     | .65572   | .02226     |

Table 24

Summary Table of Multiple Stepwise Regression  
 Criterion Variable--Reading Ability  
 Predictor Variables--Six Types of  
 Incorrect Responses on English  
 Cloze

| Step<br>Number                | Variable                                                                 | Multiple R | R Square | RSQ Change |
|-------------------------------|--------------------------------------------------------------------------|------------|----------|------------|
| Type of Incorrect<br>Response |                                                                          |            |          |            |
| 1                             | <u>Type III</u><br>synt. unacceptable<br>sem. unacceptable<br>in passage | .60576     | .36694   | .36694     |
| 2                             | <u>Type VI</u><br>no response                                            | .71065     | .50502   | .13808     |
| 3                             | <u>Type IV</u><br>synt. acceptable<br>sem. acceptable<br>in thought unit | .75642     | .57218   | .06716     |
| 4                             | <u>Type II</u><br>synt. acceptable<br>sem. unacceptable<br>in passage    | .77378     | .59873   | .02655     |
| 5                             | <u>Type V</u><br>nonstandard<br>comprehensible<br>in thought unit        | .77684     | .60348   | .00475     |
| 6                             | <u>Type I</u><br>synonym<br>acceptable<br>in passage                     | .77760     | .60466   | .00117     |

Table 25

Summary Table of Multiple Stepwise Regression  
 Criterion Variable--Reading Ability  
 Predictor Variables--Six Types of  
 Incorrect Responses on Health  
 Cloze

| Step<br>Number                | Variable                                                                 | Multiple R | R Square | RSQ Change |
|-------------------------------|--------------------------------------------------------------------------|------------|----------|------------|
| Type of Incorrect<br>Response |                                                                          |            |          |            |
| 1                             | <u>Type III</u><br>synt. unacceptable<br>sem. unacceptable<br>in passage | .62845     | .39495   | .39495     |
| 2                             | <u>Type I</u><br>synonym<br>acceptable<br>in passage                     | .66084     | .43671   | .04176     |
| 3                             | <u>Type IV</u><br>synt. acceptable<br>sem. acceptable<br>in thought unit | .67648     | .45762   | .02091     |
| 4                             | <u>Type VI</u><br>no response                                            | .73066     | .53386   | .07624     |
| 5                             | <u>Type II</u><br>synt. acceptable<br>sem. unacceptable<br>in passage    | .75672     | .57262   | .03876     |
| 6                             | <u>Type V</u><br>nonstandard<br>comprehensible<br>in thought unit        | .75714     | .57326   | .00064     |

Table 26

Summary Table of Multiple Stepwise Regression  
 Criterion Variable--Reading Ability  
 Predictor Variables--Six Types of  
 Incorrect Responses on Social  
 Studies Cloze

| Step<br>Number | Variable                                                          | Multiple R | R Square | RSQ Change |
|----------------|-------------------------------------------------------------------|------------|----------|------------|
|                | Type of Incorrect<br>Response                                     |            |          |            |
| 1              | Type III<br>synt. unacceptable<br>sem. unacceptable<br>in passage | .62321     | .38839   | .38839     |
| 2              | Type IV<br>synt. acceptable<br>sem. acceptable<br>in thought unit | .70774     | .50090   | .11251     |
| 3              | Type VI<br>no response                                            | .75942     | .57672   | .07583     |
| 4              | Type II<br>synt. acceptable<br>sem. unacceptable<br>in passage    | .77255     | .59684   | .02012     |
| 5              | Type I<br>synonym<br>acceptable<br>in passage                     | .77360     | .59845   | .00161     |
| 6              | Type V<br>nonstandard<br>comprehensible<br>in thought unit        | .77372     | .59863   | .00018     |

Table 27

Varimax Rotated Factor Matrix, Number of Correct Responses, Six Types of Incorrect Responses on English Cloze, and Reading Ability of Each Subject

| Variable                                                                                 | Factor |      |      |      |      |      | Communality |
|------------------------------------------------------------------------------------------|--------|------|------|------|------|------|-------------|
|                                                                                          | I      | II   | III  | IV   | V    | VI   |             |
| 1. No. of correct responses                                                              | 804    | -283 | 019  | 441  | -279 | -021 | 999         |
| 2. No. of Type I inc. responses<br>synonym acceptable in passage                         | 176    | -005 | 962  | 112  | -056 | -020 | 972         |
| 3. No. of Type II inc. responses<br>synt. acceptable, sem.<br>unacceptable in passage    | -357   | 081  | -063 | 070  | 916  | 006  | 981         |
| 4. No. of Type III inc. responses<br>synt. unacceptable, sem.<br>unacceptable in passage | -955   | -056 | -144 | 178  | 161  | -058 | 997         |
| 5. No. of Type IV inc. responses<br>synt. acceptable, sem.<br>acceptable in thought unit | -105   | 968  | -009 | 207  | 073  | -007 | 996         |
| 6. No. of Type V inc. responses<br>nonstandard, comprehensible<br>in thought unit        | 025    | -004 | -018 | 051  | 005  | 960  | 925         |
| 7. No. of Type VI inc. responses<br>no response                                          | -115   | -284 | -126 | -935 | -097 | -073 | 998         |
| 8. Reading Ability                                                                       | 634    | -102 | 189  | 325  | -227 | -003 | 605         |

Table 28

Varimax Rotated Factor Matrix, Number of Correct Responses, Six Types of Incorrect Responses on Health Cloze, and Reading Ability of Each Subject

| Variable                                                                                 | Factor |      |      |      |      |      | Communality |
|------------------------------------------------------------------------------------------|--------|------|------|------|------|------|-------------|
|                                                                                          | I      | II   | III  | IV   | V    | VI   |             |
| 1. No. of correct responses                                                              | 799    | 389  | 277  | -327 | 050  | 139  | 953         |
| 2. No. of Type I inc. responses<br>synonym acceptable in passage                         | 281    | 144  | 150  | -155 | 739  | 248  | 737         |
| 3. No. of Type II inc. responses<br>synt. acceptable, sem.<br>unacceptable in passage    | -436   | 129  | 016  | 752  | -168 | -104 | 796         |
| 4. No. of Type III inc. responses<br>synt. unacceptable, sem.<br>unacceptable in passage | -891   | 165  | 192  | 137  | -226 | -106 | 910         |
| 5. No. of Type IV inc. responses<br>synt. acceptable, sem.<br>acceptable in thought unit | -048   | 223  | -928 | -001 | -124 | 141  | 914         |
| 6. No. of Type V inc. responses<br>nonstandard, comprehensible<br>in thought unit        | -048   | -046 | 040  | 024  | -056 | -223 | 046         |
| 7. No. of Type VI inc. responses<br>no response                                          | -072   | -916 | 264  | -104 | -134 | -182 | 934         |
| 8. Reading Ability                                                                       | 657    | 154  | 137  | -242 | 199  | 157  | 578         |

Note: Decimals omitted